Review of allergen analytical testing methodologies: Standardisation and Harmonisation Activities in Allergen Testing in the UK, EU and internationally

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3.1. Consultation: Standardisation activities

Standardisation in the allergen testing field involves the preparation of Certified Reference Materials (CRMs) which can be used as a standard when testing for each allergen to calibrate the various kits that testing labs use to standardise the data.

Standardisation is proving to be a very long and challenging process and progress has been slow. To facilitate food allergen testing and protect allergen-sensitive consumers, the Food Allergen Working Group at the AOAC is preparing a guidance document highlighting the need for Quality Control materials (QCs) rather than CRMs due to the relative simplicity and speed of preparing QCs compared to CRMs.

3.2. Definitions:

Certified Reference Material (CRM):

Reference material, accompanied by documentation issued by an authoritative body and providing one or more specified property values with associated uncertainties and traceabilities, using valid procedures. Traceability includes metrological traceability, metrological traceability is a property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

(JCGM, 2012)

A CRM must demonstrate compliance to International Organisation for Standardisation Standard ISO 17034:2016 and ISO Guidelines 35:2006 and 31:2015. Therefore, CRMs tend to incur a high cost of preparation. A key point is that a reference method is necessary to establish a CRM. Such a reference method is available (currently) for only one allergen, cows' milk. This has been established in a series of studies from the JRC Geel (See section 2.4.7.2).

Few CRMs are available. Work is ongoing at the European Commission Joint Research Centre for which certain CRMs are planned for completion within the next two years.

Reference Material (RM):

Material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended use in measurement or in examination of nominal properties (JCGM, 2012)

The producer of an RM does not have to be ISO 17034 compliant.

Projects with aims to produce RMs include:

- FSA-funded project FS101206 for which an output was a chocolate paste RM containing skimmed milk powder, egg white powder, almond, hazelnut and walnut flours at the 10 mg/kg level along with a negative chocolate paste RM.

- the NIST Food Allergen Program (USA). Current food allergen CRMs from NIST include a value for total commodity as determined by non-specific approaches, such as total nitrogen measurement, and contain no direct link between the measured food allergen protein(s) and the reported total commodity value. NIST are now working to provide RMs which improve the connection between the measured protein food allergen and the reported total commodity value.

Quality Control material (QC): No regulations are imposed, matrix containing a specified level of allergen. Lower cost of preparation compared to RMs or CRMs. However, information on traceability and uncertainty may be lacking.

- In terms of similar Codex Alimentarius, ISO and CEN activities, the absence of CRMs and RM s may have adversely impacted the development of standards for allergen detection methods. CRMs for egg and milk had been developed as part of the initiative of the MoniQA Association (the International Association for Monitoring and Quality Assurance in the Total Food Supply Chain) and were commercially available. However, there have been recent challenges to these particular CRMs and they are no longer available

QCs are already available on the market, often from proficiency testing providers and these going some way to mitigate issues relating to the lack of RM until RMs are available.

One of the complications of preparing CRMs or QCs is that not all matrices respond in the same way during allergen testing, for example the allergen level yielded by a test may be impacted by the level of processing of a product, or the matrix types, for example oils matrices compared to baked goods. There is also a significant difference in the level of allergen yielded in a RM or QC which has been prepared by spiking with allergen post-production compared to an incurred RM (i.e. a matrix into which the allergen is spiked prior to processing). Since the production of incurred materials is time consuming and costly, it may only be feasible to prepare incurred materials for some key matrices. Therefore, the production of a range of RMs for each allergen, comprising a variety of matrix types so that data can be compared to matrix-matched RMs, may not be possible.

One of the recently emerging methods of allergens detection is the quantitation of multiple allergens by mass spectrometry. These methods require RMs. One of the objectives of the European Food Safety Authority (EFSA) project, “Detection and Quantification of Allergens in Foods and Minimum Eliciting Doses in Food Allergic Individuals (or ThRAll Project, reference GP/EFSA/AFSCO/2017/03) is to develop a harmonised quantitative MS-based prototype reference method for the detection of multiple food allergens in standardised incurred food matrices. This will be undertaken for cow's milk, hen's egg, peanut, soybean, hazelnut, and almond incurred into two highly processed food matrices, chocolate and broth powder. This project is co-funded by EFSA, United Kingdom Food Standards Agency and Belgian Federal Agency for the Safety of the Food Chain (FASFC) (see Section 5).

Commercial interests often override efforts to achieve standardisation, partly since the testing companies and the standardisation organisations both have commercial interests which may conflict. Nevertheless, efforts have been made by many of the standardisation bodies to determine the performance requirements of each method so that standardisation bodies could state which kits meet the performance characteristics (and therefore should be used by testing laboratories). For example, AOAC have developed the approach of SMPRs (Standard Method Performance Requirements) which facilitates the development of new methods, unhampered by existing, single-method-specific standards. If performance requirements were agreed unilaterally, this may facilitate standardisation activities in addition to supporting method development. Existing, method-specific standards may hamper the development of improved methods. A unilateral agreement of Method Performance criteria would allow such improved method development without having to perform a long and laborious standardisation process for each method.

3.3. Harmonisation activities

In comparison to the complexities impeding the development of activities aimed at standardisation, taking steps towards achieving harmonisation provides the opportunity to expedite the process to support comparative allergen analyses. With harmonisation, all testing facilities would use the same Quality Control standard (or the same CRM) to calibrate a test method to achieve more consistent results.

In Japan, an approach was adopted whereby the government organised the validation of allergen test kits manufactured by three providers for which test kits provided comparable results in validation studies. The three kit manufacturers were Morinaga Institute of Biological Science Inc., R-Biopharm AG and Nippon Chemiphar Co. Ltd. The Japanese government only recognises data generated using these three successfully validated kits, hence the majority of manufacturers producing food for the Japanese market follow suit and use only testing labs which use these kits. It could be that FSA, Defra or British Retail Consortium organise a similar kit validation process to harmonise allergen testing in UK. There is also a possibility that AOAC could offer the certification of certain commercial kits.